

TAXONOMIC RELATIONSHIPS AND BIOLOGY
OF *MACRORHOPTUS* (CURCULIONIDAE)¹

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ABSTRACT

Macrorhoptus is excluded from the tribes with which it has previously been associated (Anthonomini, Bradybatini and Endaeini) by a combination of larval, pupal and adult characters. The genus is provisionally retained in Anthonominae without assignment to tribe. All species of *Macrorhoptus* for which biological information is available utilize malvaceous plants as hosts, completing larval development in the fruit capsules. The larval and pupal stages of the genus are illustrated for the first time.

INTRODUCTION

As part of revisionary studies currently being conducted on *Anthonomus* Germar, it has been necessary to review the taxonomic relationships of all categories above the species level which are (or have been) included in the subfamily Anthonominae. The problem concerning the relationship of *Macrorhoptus* LeConte to other genera in the subfamily is especially perplexing, although some new data on the adult and immature stages of species of *Macrorhoptus* help to clarify certain points. The significance of larval, pupal, and adult characters, as they relate to the taxonomic position of *Macrorhoptus*, is discussed in the present paper. Since little has been published on the biology of *Macrorhoptus*, some observations made during the study are also presented. A thorough revision of *Macrorhoptus* is needed, as there are undescribed species in the genus, and correct determination of certain described species, by use of existing keys, is extremely difficult, if not impossible. Furthermore, evaluation of what appears to be a rather high degree of infraspecific morphological variation, in some species, has not yet been attempted. Involvement in taxonomic investigations of the tribe Anthonomini (from which *Macrorhoptus* is herein excluded) prevents me from undertaking a revision at this time.

Macrorhoptus has previously been recorded only from North America; however, the genus is much more widely distributed; specimens (apparently undescribed) assignable to it have recently been examined from Argentina. Another specimen seen from Panama represents either an aberrant species of *Macrorhoptus* or a closely related and undescribed genus. Additional collecting in Central and South America on probable hosts (malvaceous plants) would likely greatly extend the known range of the genus as well as provide more material on which to base taxonomic decisions.

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TAXONOMIC HISTORY

Macrorhoptus was originally described to include 1 species, *M. estriatus* LeConte, and at the time it was placed in the tribe Anthonomini (LeConte 1876). LeConte mentioned that, in the classification scheme of Lacordaire (1863), *Macrorhoptus* would be placed in the group Ceratopides after *Acanthobrachium* Boheman (now *Ceratopus* Schoenherr). Most subsequent authors (Dietz 1891; Blatchley and Leng 1916; Sleeper 1957; Kissinger 1964; Hatch 1961) followed LeConte in including *Macrorhoptus* in Anthonomini. Schenkling and Marshall (1934) and Blackwelder (1947) assigned *Macrorhoptus* to the tribe Bradybatini where it was placed next to *Pseudanthonomus* Dietz. Various species of the genus were treated taxonomically by Dietz (1891), Sleeper (1957), and Hatch (1971).

TAXONOMIC RELATIONSHIPS

Macrorhoptus differs from genera of the tribe Anthonomini by the characters listed in Table 1. The larval and pupal characters enumerated therein have not heretofore been discussed in the literature. Characters of both the adult and immature stages provide good evidence that *Macrorhoptus* should not be included as a member of the tribe Anthonomini. The terminal anus and unicameral abdominal spiracles of *Macrorhoptus* larvae contrast with the subterminal anus and bicameral spiracles of Anthonomini. Considerable weight is generally given to these characters in determination of relationships among the higher categories of Curculionidae. The difference in the 2 groups in the number of larval postdorsal setae is of value as a key character, but probably is of little significance in measuring phylogenetic relationships. Postdorsal setae 2 and 4 are absent in *Macrorhoptus*; these setae are present but smaller (frequently much smaller than postdorsal setae 1, 3, and 5) in the Anthonomini. Although 3 dorsal folds can usually be counted on some of the abdominal segments of larvae of *Macrorhoptus*, these folds are always poorly developed. Larvae of Anthonomini have 3 more or less strongly developed folds on most of these segments.

The most distinctive difference between pupae of the 2 groups is that *Macrorhoptus* pupae have femoral setae while those of Anthonomini do not. In addition, *Macrorhoptus* pupae do not bear setae on the disc of the prothorax as do pupae of the Anthonomini. The posterior processes which are so prominent on pupae of all (of those known) Anthonomini (except *Cocctorus* LeConte and *Furcippus* Desbrochers) are absent in *Macrorhoptus*.

Some adult characters of *Macrorhoptus* are also of apparent value in determining the relationships of the genus. The postocular lobes vary in size among the various species of *Macrorhoptus*, but they are always present; these lobes are absent in the true Anthonomini. The presence of a dorsal comb on the metatibia of *Macrorhoptus* readily separates this genus from the genera of Anthonomini. Additional differences involving the scrobe, lateral rostral groove, and prosternum are listed in Table 1 and figured.

The immature stages have not been described for other genera and tribes with which *Macrorhoptus* should be compared and, consequently, comparisons must be made entirely on adult characters. *Macrorhoptus* obviously does not belong to the tribe Bradybatini to which it is assigned by Schenkling and Marshall (1934) and Blackwelder (1947). In fact, Bradybatini, as conceived by Schenkling and Marshall, is an extremely poorly defined assemblage

TABLE 1. COMPARISON OF *Macrorhoptus* WITH GENERA OF THE TRIBE ANTHONOMINI.

Stage and Character	<i>Macrorhoptus</i> ²	Genera of Anthonomini ³
ADULT		
(1) scrobes	well defined (Fig. 2)	poorly defined or absent
(2) lateral rostral groove	absent	present
(3) prosternum	emarginate (Fig. 4)	not emarginate
(4) prothoracic post-ocular lobes	slight to well defined (Fig. 2)	absent
(5) metatibiae	with dorsal comb (Fig. 3)	without dorsal comb
LARVA		
(6) anus	terminal (Fig. 1a,b)	subterminal
(7) postdorsal setae	3 pairs	5 pairs
(8) abdominal spiracles	unicameral	bicameral
PUPA		
(9) ninth abdominal segment	without posterior projection (Fig. 5)	usually with posterior projections
(10) pronotal setae	posteromedian setae absent; posterolateral series confined to lateral margins of pronotum	posteromedian setae present; posterolateral series extends on to the disc of pronotum
(11) femoral setae	present	absent

²Adults of all known species of *Macrorhoptus* examined. Information on larvae and pupae obtained from study of *M. estriatus* LeC., *M. sphaeralciae* Pierce, and *M. sp.* (probably undescribed).

³Adults of the following genera examined: *Anthonomopsis* Dietz, *Anthonomus* Germar, *Brachyogmus* Linell, *Cionomimus* Schenkling and Marshall, *Chelonychus* Dietz, *Cionopsis* Champion, *Coccotorus* LeConte, *Epimechus* Dietz, *Furcipes* Desbrochers, *Lonchophorus* Chevrolat, *Magdalinops* Dietz, *Nanops* Dietz, *Pseudanthonomus* Dietz, *Smicraulax* Pierce, *Tachypterellus* Fall and Cockerell.

Pupae of 49 species of 9 genera (Burke 1968; Burke and Hafernik 1971) and larvae of 51 species of 10 genera (Ahmad and Burke 1972) have been examined.

of genera, several of which (e.g., *Cionopsis* Champion, *Cionomimus* Schenkling and Marshall, *Pseudanthonomus* Dietz and *Smicraulax* Pierce) actually belong in Anthonomini. *Bradybatus* Germar differs most significantly from *Macrorhoptus* in having lateral rostral grooves and lacking postocular lobes. *Bradybatus* also has a 6-segmented funicle while that of *Macrorhoptus* is 7-segmented.

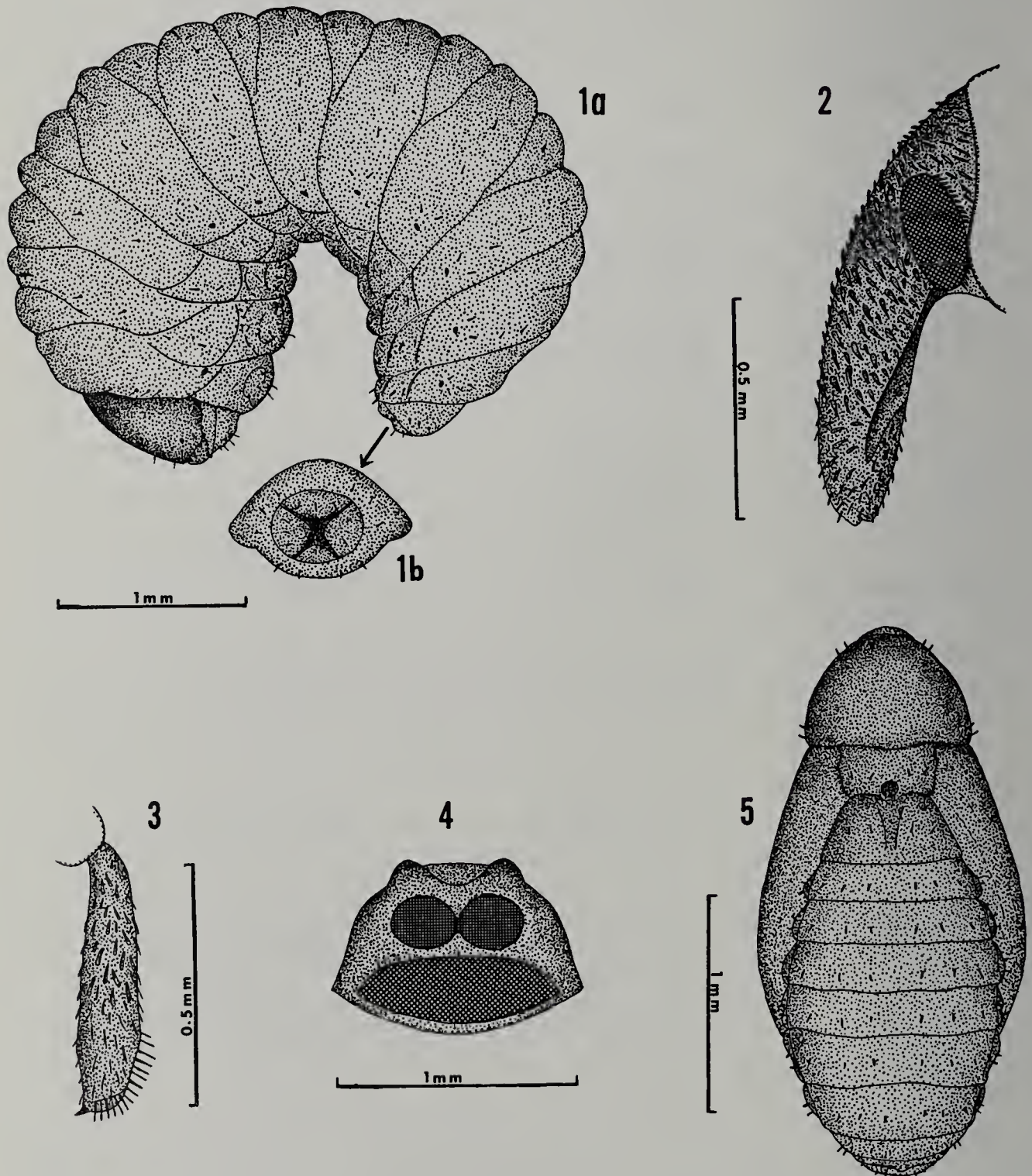


Fig. 1. Fullgrown larva of *Macrorhoptus sphaeralciae*: a) lateral view; b) posterior view (enlarged) of segment 9 and anus.

Fig. 2-4. *Macrorhoptus estriatus*: 2) lateral view of head, rostrum, and anterior margin of prothorax, male; 3) lateral view of hind tibia; 4) ventral view of prothorax.

Fig. 5. Pupa of *Macrorhoptus sphaeralciae*, dorsal view.

Macrorhoptus may also be compared with genera placed in the tribe Endaeini, another group whose constitution and subfamilial affinities are much in doubt. Schenkling and Marshall (1936) placed Endaeini in the subfamily Prionomerinae, although Marshall (1933) had earlier referred *Endaeus* Schoenherr to Anthonominae. Klima (1934) assigned *Endaeus* to the subfamily Tychiinae. Endaeini was treated as a tribe of Anthonominae by Kissinger (1964). No extensive study has been made of the genera usually placed in Endaeini, but a preliminary survey revealed a few characters which some of these genera share in common. The scales on the prothorax are arranged transversely, the claws are appendiculate, lateral rostral grooves (in addition to the scrobes) are present, and several genera (*Endaeus*, *Ochyromera* Pascoe, *Thysanocnemis* LeConte, and *Neotylopterus* Hustache) have at least some of the abdominal sterna angulated laterally. *Macrorhoptus* differs from this group of genera by having the dorsal pronotal setae longitudinally or diagonally arranged, tarsal claws toothed, lateral rostral groove absent, and the abdominal sternal sutures straight at the sides.

The differences mentioned above indicate that *Macrorhoptus* is not closely related to any of the genera presently placed in Anthonomini, Bradybatini, and Endaeini, and it should not be assigned to either of these tribes. There is some justification for erecting a new tribe for *Macrorhoptus*; however, considering the present poor state of knowledge of the tribal classification of most Curculionidae, I feel that no useful purpose would be served by doing so. *Macrorhoptus* should be retained in Anthonominae for the present, although the evidence is by no means conclusive that the genus is even a member of the subfamily. Assignment to a tribe should be deferred until more information has been accumulated on a wider range of genera with which *Macrorhoptus* should be compared.

BIOLOGY

Biological information on *Macrorhoptus* is scarce in the literature and consists mostly of incidental observations made on the hosts and developmental sites of a few species. Pierce (1907) was the first to publish on the biology of the genus, noting that the eggs of *M. estriatus* are deposited in the seed capsules of *Callirhoe involucrata* (Torr.) Gray in Texas. According to Pierce, the larva feeds on 2 carpels of the fruit and, upon becoming mature, pupates in the feeding cavity. Pierce (1908) described *M. sphaeralciae* from specimens reared from the capsules of *Sphaeralcea angustifolia* (Cav.) D. Don in Texas. Sleeper (1957) described *M. sidalceae* from specimens "bred from seeds of *Sidalcea hendersoni*" in British Columbia. Stoner (1968) and Hatch (1971) mentioned the association of *M. hispidus* Dietz with *Sphaeralcea* spp., and I have examined specimens reared from fruit capsules of *Sphaeralcea Fendleri* Gray and *Sphaeralcea Emoryi* Torrey in Arizona. No host records have been published for the remaining 3 described species of *Macrorhoptus*. All of the above-mentioned plants are Malvaceae and these reports, along with my own observations, indicate that *Macrorhoptus* is confined to members of this family as hosts.

Some additional biological information has been accumulated on *M. estriatus*. Eggs are not always deposited in the capsule as Pierce (1907) noted, although the majority are probably placed there. Observations made mainly during May, 1971 at College Station, Texas revealed that *M. estriatus* some-

times deposits eggs in the stems of *C. involucrata* 3 or 4 mm below the seed capsule. When plants were first examined on 30 April, eggs were numerous in the stems. The egg puncture is quite evident and usually only 1 egg is deposited in each stem, although 1 plant examined contained 5 eggs in a single oviposition hole. A few newly hatched larvae were also present at the time. The larvae apparently start burrowing upward soon after hatching, moving through the pith channel into the base of the capsule rather than tunneling through the more solid tissue of the stem. On the same plants, larvae were found in capsules where there was no evidence of entry through the stems; in these cases the females obviously inserted eggs directly into the capsules.

At the same time I made observations on the life history and habits of another species which is apparently undescribed. It is obviously most closely related to *Macrorhoptus griseus* Sleeper and is easily distinguished from all other members of the genus by the straight, slender rostrum of the female. It was first found on *Malvastrum aurantiacum* (Scheele) Walp during May 1970 near Bryan, Texas. By early June, large numbers of adults were present on the plants. On 10 June, eggs, some first instar larvae and a few fullgrown larvae occurred in the fruit capsules. Eggs are deposited most frequently through punctures in the tops of the carpels, although sometimes the eggs are placed in the outer edges of the carpels. The eggs are normally elongate but are often quite misshapen, assuming the shape of the puncture in which they are placed.

Newly hatched larvae begin feeding on seeds. When a seed is consumed, the larva tunnels through the carpel wall and feeds on the adjacent seed. Several larvae may complete development in the same capsule. The weevil larva packs the frass in one end of the cavity or around the sides of the cavity. Pupation occurs in the carpel in the cavity formed by feeding of the larva. The adult emerges through a hole chewed in the side of the carpel wall.

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